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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/575,055	05/19/2000	Q.Z. Liu	99CON114P	2945

25700 7590 03/29/2004

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EXAMINER

LUU, CHUONG A

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 03/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

8M

Office Action Summary

Application No.

09/575,055

Applicant(s)

LIU ET AL.

Examiner

Chuong A Luu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 December 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-23 is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

PRIOR ART REJECTIONS

Statutory Basis

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The Rejections

Claims 1-4 and 7-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Liu (U.S. 6,271,127 B1)

Liu discloses a method for forming a dual damascene structure with

(1) covering a first area in a dielectric, said dielectric having a first dielectric constant;

exposing a second area in said dielectric to a dielectric conversion source so as to increase said first dielectric constant of said dielectric in said second area to a second dielectric constant (see column 7, line 67 and column 8, lines 1-40);

(2) wherein said covering said dielectric with photoresist (see column 6, lines 66-67);

(3) wherein said dielectric conversion source comprises E-beams (see column 6, lines 34-65);

(4) wherein said dielectric conversion source comprises I-beams (see column 3, lines 1-24);

(7) wherein said dielectric is hydrogen silsesquioxane (see Figure 4b);

(8) further comprising steps of: etching a plurality of interconnect trenches in said first area in said dielectric and etching a plurality of capacitor trenches in said second area in said dielectric (see Figure 4f);

(9) further comprising a step of filling each of said plurality of capacitor trenches and each of said plurality of interconnect trenches with metal (see Figures 4p-4q);

(10) wherein said metal is copper (see column 7, lines 59-60).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (U.S. 6,271,127 B1) in view of Lou (U.S. 6,277,732 B1)

Liu discloses the above outlined features except for wherein said dielectric conversion source comprises oxygen plasma. However, Lou discloses a method of forming a semiconductor device with (6) wherein said dielectric conversion source comprises oxygen plasma (see column 12, lines 31-46). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the above references to produce a semiconductor device to meet specific performance criteria.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu (U.S. 6,271,127 B1) in view of Yang et al. (U.S. 6,042,994).

Liu teaches everything above except for wherein said dielectric conversion source comprises an amine based chemical. However, Yang discloses a nanoporous silica dielectric film with (5) wherein said dielectric conversion source comprises an amine based chemical (see column 5, lines 40-56). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the above references to produce a semiconductor device to meet specific performance criteria.

Response to Arguments

Applicant's arguments filed on December 04, 2003 have been fully considered but they are not persuasive.

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Applicant argues that Liu does not teach nor suggest “covering a first area in a dielectric, said dielectric having a first dielectric constant,” and “exposing a second area in said dielectric to a dielectric conversion source so as to increase said first dielectric constant of said dielectric in said second area to a second dielectric constant”. Even though, Liu does not explicitly disclose the step of covering a first area in a dielectric layer as claimed. In Liu, column 6, lines 36-54, low-k material layer (52) is cured by exposure to either an electron beam, which involves electron beam radiation and rapid thermal heating, or ion implantation, which involves both ion implantation and rapid thermal heating. However, it is inherently that the Liu reference does teach or disclose a process to increase the dielectric constant by curing with an electron beam (see column 7, line 67 and column 8, lines 1-40).

Allowable Subject Matter

Claims 11-23 are allowed.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chuong A Luu whose telephone number is (571) 272-1902. The examiner can normally be reached on M-F (6:30-3:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-1975.

CAL
March 22, 2004


CARIDAD EVERHART
PRIMARY EXAMINER